

XVII.—*Remarks on the Flora of the Northern Shores of America, with Tabulated Observations made by Mr. F. F. PAYNE on the seasonal development of Plants at Cape Prince of Wales, Hudson Strait, during 1886. By GEORGE LAWSON, Ph.D., LL.D.*

(Read May 25, 1887.)

The observations made by Mr. Payne on the progress of vegetation during the spring, summer and autumn of 1886, at Cape Prince of Wales, Hudson Strait, cannot fail to be of interest and use to those who are desirous of definite knowledge respecting the climate of the Hudson Strait shores during the period of active plant growth. But a knowledge of our northern vegetation is not only of interest in enabling us to form a judgment as to the general character of the climate, or ascertain how far a given district is capable of producing cultivated crops or plants that are in any way useful in the economical sense; there are other questions which, if more remote from immediate practical utility, are yet not of less interest from a scientific point of view, and every contribution of information, whether in form of observations or specimens, is of value. The floras of our northern shores gradually merge northwardly into the composite flora found within the Arctic circle, commonly called "the Arctic flora," the remarkable composition of which has given rise to speculation as to its origin. Sir Joseph Hooker accounts for it by assuming extensive changes of climate and of land and sea, leading to a spread of Scandinavian species over the whole polar zone, and the subsequent introduction of Asiatic and American species, with which the Scandinavian are so largely associated in all the Arctic districts except those of Europe and Greenland. Some of the difficulties of this view are overcome, if we admit, with Darwin and Hooker, the great antiquity of the Scandinavian flora, and the hypothesis originated by Edward Forbes and extended by Charles Darwin, that previous to the Glacial Epoch, that flora was more uniformly distributed over the whole polar zone than now; that during that period it was driven southward in every longitude, even across the tropics into the south temperate zone; and that, on the succeeding warmth of the present epoch, the surviving species again spread northward, accompanied by aborigines of the countries which they had invaded during their southern migration, and leaving behind on the northward march stragglers of the Scandinavian flora that found permanent refuge in the mountains of the warmer zones. The discussion of such an hypothesis necessarily opens up questions of variation, adaptation, and survival, under changing conditions of climate and over large areas of the earth's surface. It will be seen, at once, how important it is to have our Northern American species carefully collocated with those of Northern Europe and Asia, especially such of them as belong, or are allied, to species of the true Scandinavian flora. It is not the discovery of new species on our northern shores that is the object most to be desired in the interest of science, for we have already a confusing plethora of names, but rather the collection of material to enable us to ascertain more accurately the relations to each

other of the species that have been already described, so that duplicate names may be eliminated, and our nomenclature placed on such a basis that equivalent forms—whether species, so-called subspecies, or varieties, or even less pronounced forms—may be compared together from the several regions, as evidence of community of origin, or otherwise, or to indicate possible or probable sources of derivation.

At an early period in the century preceding the present one, long before questions of origin had arisen, and long before it was thought of any consequence to mankind to ascertain the possibilities of productive culture on our northern coasts, Linnaeus's "Tour in Lapland" and the "Flora Lapponica" had excited an interest in these little northern plants from the systematic botanist's point of view. And, while, subsequently, the Scandinavians themselves and the botanists of Russia, have been active in making known the vegetation of the northern verges of Europe and Asia, so the northern shores of America and the Greenland coast have been visited by whaling vessels, whose officers have, season after season, carried specimens to British botanists; but the principal botanical work on our shores has been accomplished by the numerous exploring expeditions sent out from time to time by England and the United States, whose collections have been elaborated in the most careful manner and the results systematised and published for general use.

More recently, substantial work has been done at the meteorological stations for observation on Hudson Strait, and especially by Dr. Robert Bell, scientist and medical officer of the expedition to Hudson Bay in 1884, a list of whose botanical collections, identified by Prof. Macoun, has been published.

Work still remains to be done by observers who have opportunity, and it may be thus summarised:—To collect and dry specimens in as many conditions or stages of growth as possible, carefully noting (1) dates of collection, (2) kinds of soil, whether sandy, loamy, clayey, peaty, these greatly affecting moisture and temperature, (3) distance from sea shore, elevation above sea-level, (4) surroundings of locality or particular spot where the plant is gathered, as regards protection from cold, or conditions of shelter favourable to prolonged humidity of atmosphere or to accumulation of warmth in time of sunshine. These particulars are specially mentioned, not only because they are intrinsically of special importance; but because we had scarcely any systematic observation of them, until the establishment of the stations of observation on Hudson Strait. It is to be hoped that what has been begun so well by the Hudson Strait observers, will be continued and developed by those who have opportunity, from time to time, to add to the information already acquired. These regions are so seldom visited in the ordinary course of travel, and the collection and preservation of specimens is attended with so many difficulties, that even the veriest scraps are welcome to the home botanist. How much more valuable are specimens, carefully selected so as to show modifications of form, and thus serve to determine questions of specific identity or distinction, or those collected at different times during the seasons of sprouting or budding, leaf-development, flowering, ripening of seeds, and autumn withering, or fall of leaf or browning of evergreens, with dates carefully recorded, so as to show the beginning, progress and ending of the annual growing period for vegetation.

In the following tabulation of Mr. Payne's observations, the several columns after that containing the name of the species give:—

A.—Date of spring-budding in case of shrubs, and sprouting or appearance of new shoots from the rhizomes of herbaceous plants.

B.—Date when plant was found in leaf, i.e., when leaves of the season were fairly developed.

C.—When first found in flower.

D.—When specimens were found with ripe seeds.

E.—Autumn withering of foliage, or defoliation.

F.—Particulars as to the nature of the habitat of each species, or spot where found growing—especially with respect to proximity to, or distance from, the sea-shore, elevation above sea-level, whether in exposed hilly situations, or sheltered, or protected amongst rocks or in water-courses, etc.; general character of soil, whether gravelly, sandy, compact, or peaty, and whether moist or dry, etc. Northern plants have a special tendency to assume luxuriant forms when grown in sheltered spots where the air is kept moist by waterfalls, rapid streams, or even rocky brooks.

Corresponding observations of these several phenomena in the same species of plants in any other locality or country will enable a comparison to be made of its climate, so far as it affects vegetation, with that of Cape Prince of Wales. The variations of seasons in different years in the same locality may also be determined from such observations.

The names of all the species were determined from a careful examination by myself of Mr. Payne's specimens. The condition of the plants, as to progress of seasonal growth at the several dates, as noted by Mr. Payne at the time, was also ratified in each case by examination of the specimens. The abundant ripening of seeds is one of the features of Mr. Payne's collection, showing a marked difference from some of the collections taken to England by exploring expeditions. In less hospitable regions, although plants grow even luxuriantly, they are not known to ripen seeds sufficiently for germination. This has led to the belief that within the Arctic circle the permanent continuance of vegetation is dependent upon fertile seeds ripened farther south and transported to the belt of the Arctic flora. However this may be, it is interesting to note that in all the specimens from Cape Prince of Wales that were sufficiently advanced, the seeds were plump and perfect.

Additional collections have been received, but too late to be included in this paper. The results of an examination of these, as well as the consideration of some general questions regarding the northern shore flora, must consequently be deferred.

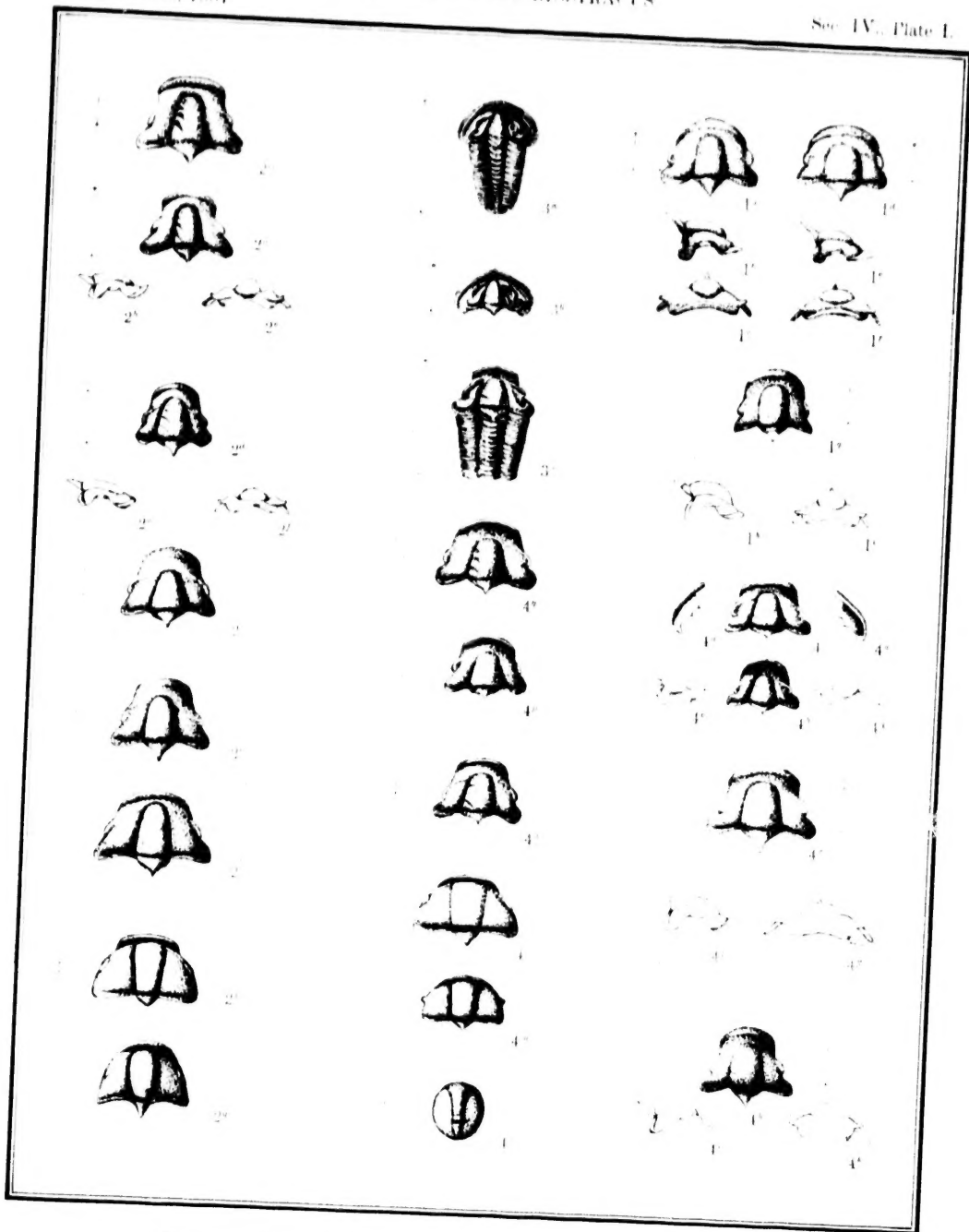
LIST OF PLANTS COLLECTED AT CAPE PRINCE OF WALES, HUDSON STRAIT, DURING THE SUMMER OF 1886, WITH NOTES OF OBSERVATIONS MADE ON THEIR GROWTH, OR SUCCESSIVE DEVELOPMENT OF ORGANS, DURING THE SEASON, NATURE OF LOCALITIES WHERE FOUND, ETC., BY F. F. PAYNE. THE SPECIES DETERMINED FROM MR. PAYNE'S SPECIMENS BY PROF. LAWSON.

A.	B.	C.	D.	E.	F.
Date of spring bud burst or seedling sprouting.	Plant in leaf, now flowered, or the season developed.	In flower.	Fruit or seed ripe.	Autumn withering.	Nature of locality or spot where found, as regards Elevation, Protection, Soil, Moisture, etc. All the plants were collected within 500 yards and most of them within 100 yards of high tide mark. The letters M.S.L. in this column refer to mean sea level.
1. <i>Ranunculus nivalis</i> , <i>Linn.</i>	June 30	July 5	Aug. 18	Aug. 20	In very dry, soil, along side margin of stream, well protected, 500 yards from high tide mark. Height above M.S.L., 40 feet.
2. <i>R. hyperboreus</i> , <i>var. pygmaeus</i> , <i>Lawson</i>	July 25	.....	.....	.....	Similar situation as preceding species (No. 1), but not near stream, although in damp soil.
3. <i>Papaver alpinum</i> , <i>Linn.</i> (P. andoulei).....	May 20	June 30	Aug. 6	Sept. 1	On dry gravel and sand, tolerably well protected, on level ground only 45½ yards from shore. Elevation above M.S.L., twenty (20) feet.
4. <i>Draba alpina</i> , <i>Linn.</i> var.	June 25	July 1	.....	.....	Similar locality as preceding, No. 3, but in soil more moist, 250 yards from shore.
5. <i>Coellearia officinalis</i> , <i>Linn.</i>	June 15	June 22	Aug. 13	Aug. 26	Same as No. 4, twenty yards from shore.
6. <i>Cerastium alpinum</i> , <i>Linn.</i>	June 15	June 22	Aug. 15	Sept. 8	In dry soil in localities similar to No. 5, very plentiful, isolated from other plants, except grass.
7. <i>C. vulgatum</i> , <i>Linn.</i>	June 15	July 8	Aug. 20	Sept. 12	In dry soil, in rocks crevices, in same locality as No. 6.
8. <i>Stellaria longipes</i> , <i>var. d. Torr. & Gr.</i>	June 30	July 5	Aug. 20	Aug. 20	Same as No. 5, grouped (in patches), but not isolated.
9. <i>Lychnis aetula</i> , <i>Linn.</i>	June 15	July 2	Aug. 14	Aug. 20	Same as No. 9
10. <i>L. aetula</i> , <i>var. affinis</i>	June 20	July 5	Aug. 22	Sept. 8	Same as No. 10, situation rather exposed, 30 feet above M.S.L.; some leaves still green on September 18.
11. <i>Silene acaulis</i> , <i>Linn.</i>	May 20	June 1	Aug. 6	Sept. 1	In dry sand, twenty feet above M.S.L., and twenty yards from high water mark; not plentiful.
12. <i>Himantocarya peploides</i> , <i>Ell.</i>	June 10	June 20	Aug. 6	Aug. 25	Sand and gravel, thirty feet above M.S.L., thirty yards from shore, on level ground only, fairly well exposed.
13. <i>Astragalus alpinus</i> , <i>Linn.</i>	June 20	June 25	Aug. 19	Aug. 25	Same situation as No. 12.
14. <i>Oxytropis arctica</i> , <i>L. Br.</i>	June 20	July 7	Aug. 20	Sept. 7	Gravelly soil on level ground, but well exposed, 100 yards from shore; elevated 30 feet above M.S.L., except land isolated.
15. <i>Dryas integrifolia</i> , <i>Vahl.</i>	June 9	July 1	Aug. 20	Sept. 1	On sand, isolated, rather exposed; 20 yards from shore; 20 feet from M.S.L.
16. <i>Potentilla nivalis</i> , <i>Linn.</i>.....	.....	.....	.....	.....	Large sand, level ground; 20 yards from shore; 50 feet from M.S.L. Some leaves still green September 5.
17. <i>P. maculata</i> , <i>Linn.</i>	May 25	June 3	Aug. 6	Aug. 20	Well protected, growing amongst moss and grass, 200 yards from shore; 20 feet above M.S.L.; tolerably dry.
18. <i>Rubus Chamomora</i> , <i>Linn.</i>	June 20	July 5	Aug. 5	Sept. 1	Much exposed, hard level beds of gravel, very dry; 80 yards from shore and 40 feet above M.S.L.
19. <i>Eriophorum latifolium</i> , <i>Linn.</i>	June 20	July 1	Sept. 5	Sept. 9	In a small pond, well protected, 50 yards from shore and 100 feet above M.S.L.
20. <i>Hippuris vulgaris</i> , <i>L. maritima</i> (tetraphylla).....	.....	.....	.....	.....	Amongst rocks, well protected; 80 yards from shore and 40 feet above M.S.L.
21. <i>Saxifraga cernua</i> , <i>Linn.</i>	June 20	July 10	Aug. 27	Sept. 5	Soil, sand and gravel.

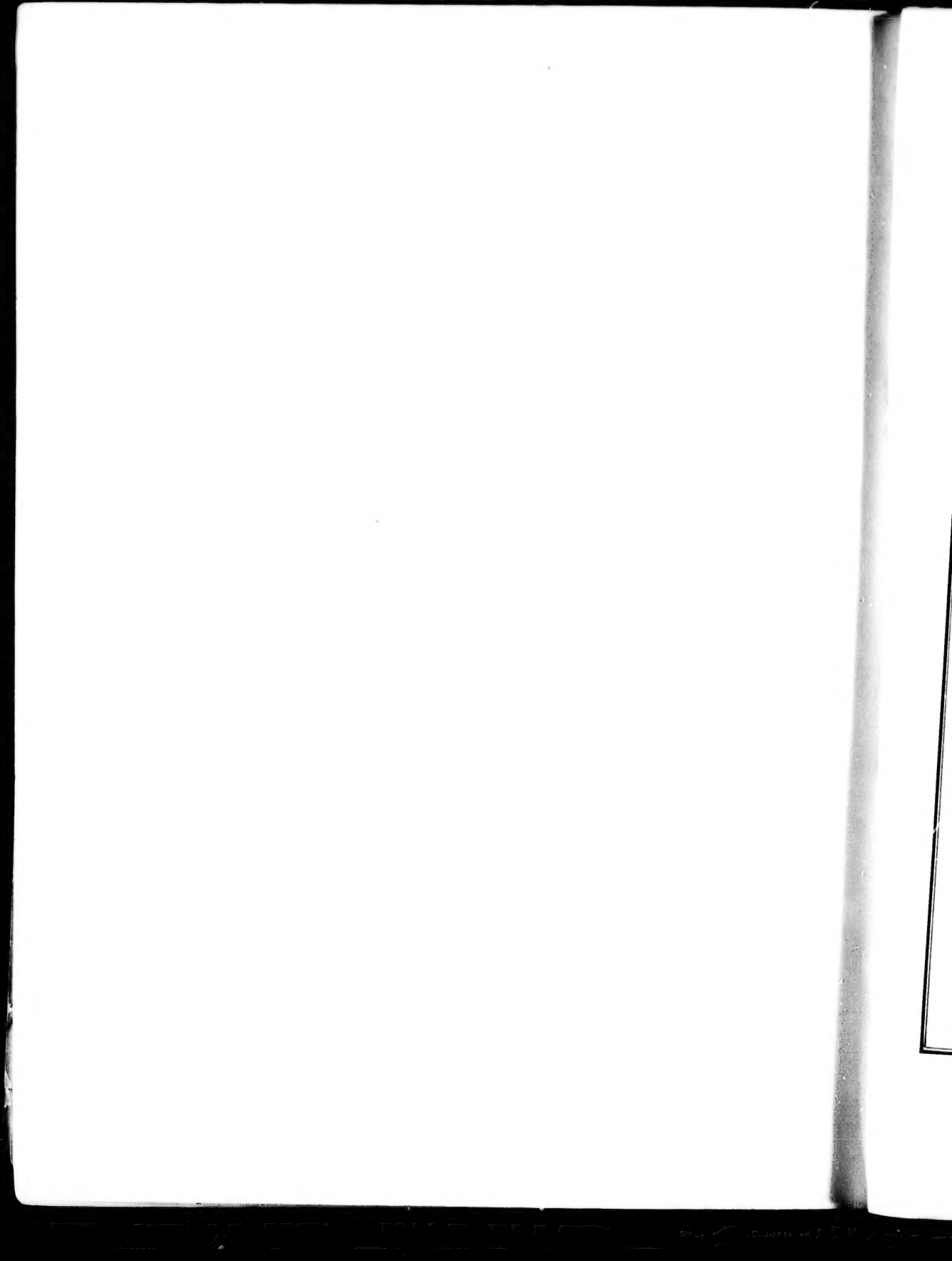
22. <i>S. triensulcata</i> , Retz		May 25	June 10	July 4	Aug. 20	Sept. 12	Remarks
23. <i>S. oppositifolia</i> , Linn		May 20	June 7	June 18	Aug. 15	Aug. 25	
24. <i>S. rivularis</i> , Linn			July 1	July 10	Sept. 3	Sept. 8	Very plentiful; dry gravel, etc., as No. 22. Leaves remain green throughout the winter. Eskimo eat quantities of the flowers.
25. <i>S. nivalis</i> , Linn		June 23	June 30	July 7	Aug. 20	Sept. 6	Damp, light soil, isolated, well protected at bottom of hills; 20 yards from shore, 50 feet above M.S.L.
26. <i>S. nivalis</i> , var. <i>h.</i>							Stratum fairly protected, 100 yards from shore, 30 feet above M.S.L. Soil rather damp; plants scattered.
27. <i>S. caespitosa</i> , Linn							On dry gravel, rather exposed; 100 yards from shore, 30 feet above M.S.L.
28. <i>Parasponia palustris</i> , Linn		May 20	June 1	June 28	Aug. 25	Aug. 31	Sand, dry, same as No. 25. Shaded sides of sprouting again, Sept. 10.
29. <i>Eriogon uniformis</i> , Linn							Average clousters in old river bed, sheltered, 400 yards from shore, 80 feet above M.S.L.
30. <i>Arctica alpina</i> , Olin		June 25	June 28	July 10	Aug. 27	Sept. 1	Gravel, dry, exposed on level, 80 yards from shore, 50 feet above M.S.L. Plant scattered.
31. <i>Antennaria alpina</i> , Linn		June 25	July 5	July 12	Aug. 27	Sept. 3	Sand, only 20 yards from shore, rather exposed; 50 feet from M.S.L. Plant rather scarce.
32. <i>Taraxacum officinale</i> , var. <i>palustre</i> , D.C. (alpinum et lividum, Koch, A. Gr. & C. salinum, E. Meyer, Fl. Labradorica)		May 26	June 10	June 22	Aug. 12	Aug. 12	Hard gravel, dry, well exposed; 60 yards from shore, 50 feet above M.S.L. Plant scattered, plentiful.
33. <i>Matricaria inodora</i> , var. <i>hansa</i> Torr. & Gr		June 7	June 30	July 4	Aug. 1	Sept. 5	Sand, protected, 20 yards from high tide mark, 20 feet above M.S.L. Not plentiful.
34. <i>Campanula uniflora</i> , Linn				July 28			Well protected, small island, 10 feet from M.S.L., 80 yards from shore.
35. <i>Vaccinium uliginosum</i> , Linn		June 15	June 25	July 7	Aug. 25	Sept. 10	Gravel, exposed on level, 80 yards from shore, 30 feet above M.S.L. Plant scattered.
36. <i>V. vitis-Idaea</i> , Linn		May 20	June 1	July 1	Aug. 31	Sept. 10	Gravel, well exposed on level, 90 yards from shore, 40 feet above M.S.L. Plant black when ripe.
37. <i>Cassiope tetragyna</i> , Linn		June 1	June 15	June 25	Aug. 25	Sept. 5	Dry gravel, well exposed, high up on hill sides, and level ground; 200 yards from shore, 100 feet above M.S.L. Some leaves remain green throughout the winter. In many instances it seems to drop until spring.
38. <i>Arctostaphylos alpina</i> , Spreng		June 1	June 22	June 22	Aug. 31	Sept. 14	Exposed on higher hills, 50 feet above M.S.L., growing between rocks. In sheltered places this plant remains green throughout the winter.
39. <i>Ledum palustre</i> , Linn (var. <i>decumbens</i> , E. Meyer)		May 25	June 1	July 1	Aug. 25	Sept. 8	Well exposed, generally on level, 200 yards from shore, 100 feet above M.S.L. Eskimo eat quantities of the berries of this plant.
40. <i>Dicentra Lappaceum</i> , Linn		May 20	June 1	July 1	Aug. 31	Sept. 5	Well exposed, but generally on south sides of hills only, 100 feet above M.S.L. Where well exposed, some leaves remain green throughout the winter.
41. <i>Pyrola minor</i> , Linn			May 25	July 10	Aug. 20	Sept. 6	Well exposed, but generally on level ground, dry gravel and sand, 100 feet above M.S.L., 200 yards from shore. Some leaves remain green throughout the winter.
42. <i>Rhodiola densa</i> Lappaceum, Wahl		May 15	May 25	June 25	Sept. 5	Sept. 10	Protected between boulders on level, 100 yards from shore, 100 feet above M.S.L. Some leaves remain green throughout the winter.
43. <i>Mertensia maritima</i> , Don		June 15	June 22	July 5	Aug. 25	Aug. 28	Exposed on level, 200 yards from shore, dry gravel, 150 feet above M.S.L.
44. <i>Pedicularis flammula</i> , Linn			July 5	July 12	Aug. 20	Aug. 25	Sand, fairly protected, isolated, 20 feet above M.S.L., 20 yards from high tide mark.
45. <i>P. Lang-Jorffii</i> , var. <i>lanata</i> , A. Gr		June 1	June 10	June 20	Aug. 12	Aug. 18	Drifted of stream, fairly protected, 20 feet above M.S.L., 30 yards from shore. Much frequented by bears, flies and butterflies.
46. <i>P. hirsuta</i> , Linn		June 1	June 15	June 20	Aug. 10	Aug. 20	Same as preceding, No. 45, rather dry, with sand and gravel. Same as preceding, Nos. 44 and 45, rather moist; earth, sand and gravel.

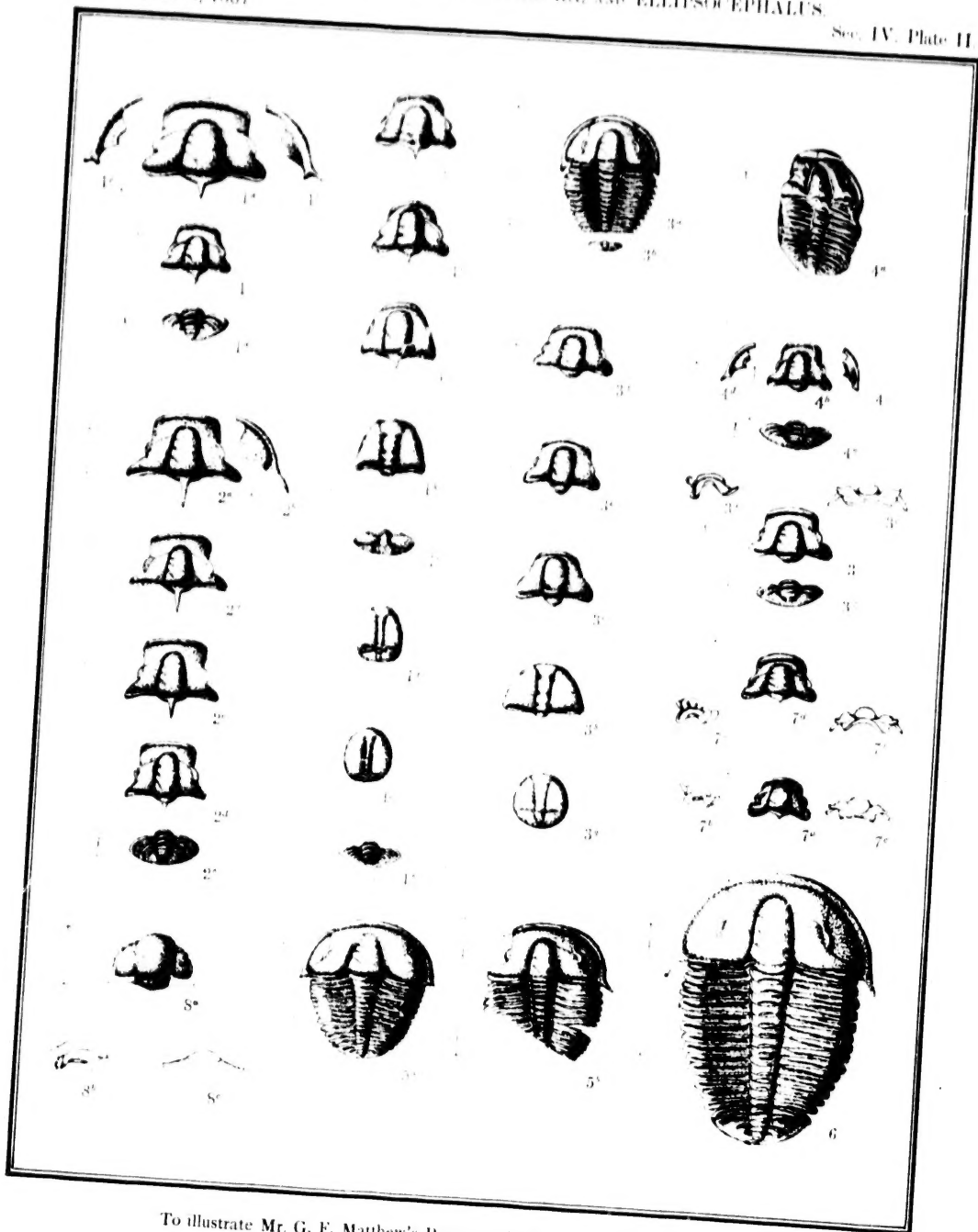
LIST OF PLANTS COLLECTED AT CAPE PRINCE OF WALES, HUDSON STRAIT, DURING THE SUMMER OF 1886.—Continued.

	A.	B.	C.	D.	E.	F.
	Date of sprouting and time of sprouting.	Plant in leaf (new leaves of the season developed)	In flower.	Fruit or seed ripe.	Autumn withering.	Name of loc. etc. or spot where found, as regards Elevation, Protection, Soil, Moisture, etc. All the plants were collected within 500 yards, and most of them within 100 yards, of high tide mark.
47	July 3	July 12	July 17	Aug. 28	Aug. 31	Same as preceding, No. 46, rather moist; earth, sand and gravel.
48	June 18	June 22	June 26	Aug. 31	Aug. 31	Dry sand and gravel, level, exposed, 40 feet above M. S. L., 100 yards from shore, Scattered.
49	June 10	June 15	June 22	July 28	Sept. 11	Generally on moist earth, along margin of streams; 30 feet above M. S. L., 100 yards from shore. Plentiful.
50	June 12	June 22	July 1	July 25	Sept. 1	Grows wherever moss grows, on damp soil. The sweet, knotty root of this plant is much sought after by Eskimo and eaten.
51	June 28	July 6	.....	.....	Sept. 10	Remains green much later in sheltered places. Grows on hillside, well exposed. Very plentiful, used by Eskimo to make fires whenever any smoking is done.
52	June 10	June 15	June 22	Aug. 20	Sept. 10	Amongst moss, well exposed, but on level ground, generally in moist places.
53	June 20	July 1	July 10	Aug. 10	Aug. 18	Dry sand and gravel, tolerably well protected, between rocks, or in old river beds, 40 feet above M. S. L.
54	.....	.....	.....	.....	.....	Well exposed on hill and level; dry light earth.
55	.....	.....	.....	.....	.....	Moist earth, rather exposed, in wide, open valley, 50 yards from shore, 200 feet above M. S. L.
56	.....	.....	.....	.....	.....	Well protected, moist, old river beds, 80 feet above M. S. L., 200 yards from shore. Plentiful.
57	.....	.....	.....	.....	.....	Sand, well protected, 20 feet above M. S. L., 15 yards from high water mark. Not plentiful.
58	May 25	June 12	July 10	Aug. 21	Sept. 8	Sand, only found close to high water mark, 15 feet above M. S. L. (Sept. 10, still green in warm, sheltered places.)
59	May 25	June 1	July 15	Aug. 28	Sept. 1	Amongst stones, protected, same as preceding, No. 56. Not plentiful.
60	June 10	June 20	July 15	.....	Sept. 10	Sand, same as preceding, No. 60, but more plentiful.
61	June 1	June 22	July 10	Aug. 25	Sept. 1	Well exposed on level, and south side of hill; dry, light soil, amongst rocks, 80 feet above M. S. L.
62	June 20	July 1	July 15	Sept. 3	Sept. 8	Well protected, amongst stones, close to high tide mark; scarce. (Sept. 20, some blades still green.)
63	June 1	June 25	July 15	Aug. 31	Aug. 31	Well protected, amongst rocks, near shore, 20 feet above M. S. L.; grouped, scarce. (Sept. 10, fronds quite green and fresh looking.)
64	.....	.....	June 1	.....	.....	Well protected amongst boulders and rocks, 200 yards from shore, 60 feet above M. S. L., grouped, scarce. (Sept. 10, fronds quite green and fresh looking.)
65		June 30	June 20			Amongst moss, 200 yards from shore, rather exposed, 60 feet above M. S. L.
66						

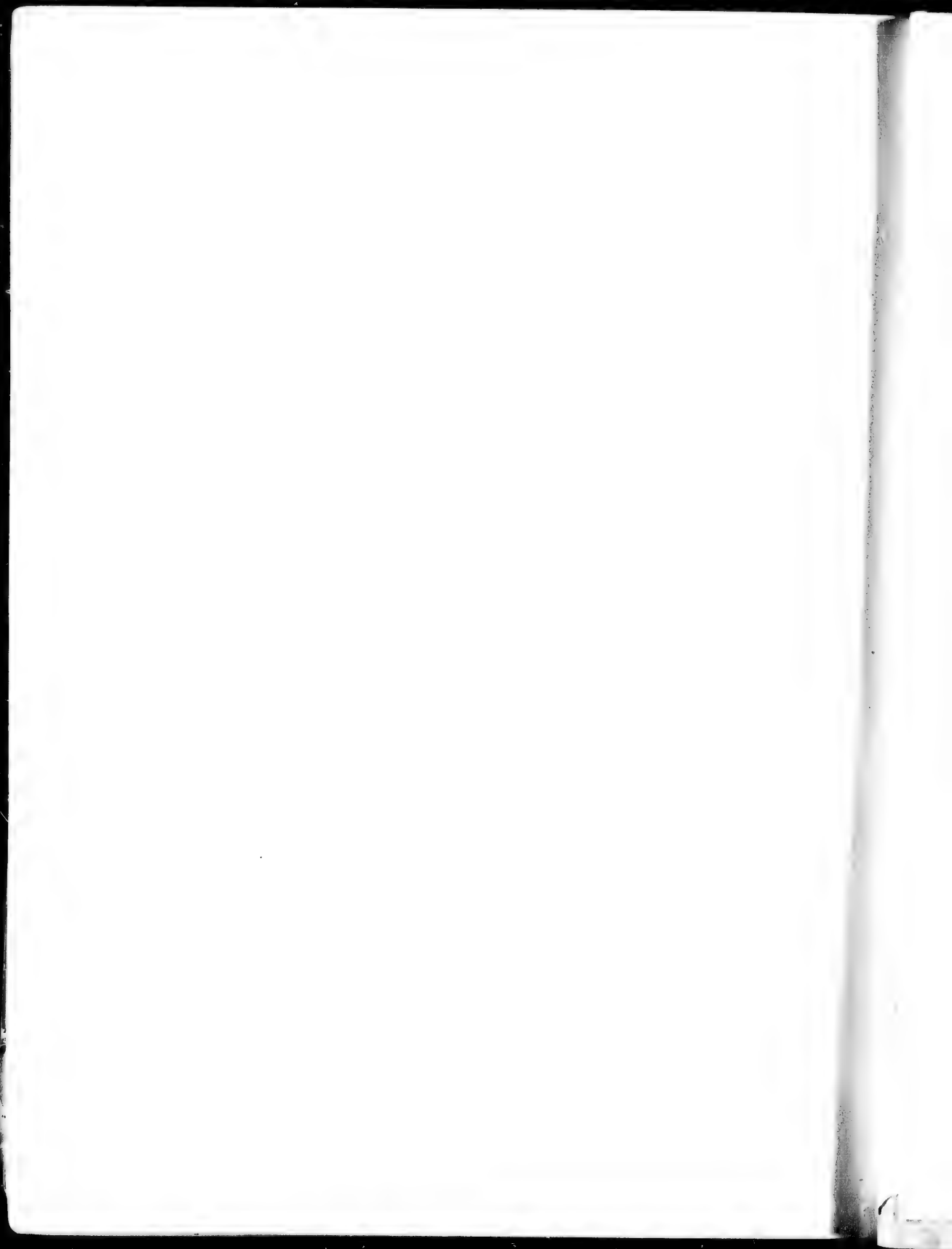


To illustrate Mr. G. F. Matthew's Paper on the Fauna of the St. John Group.

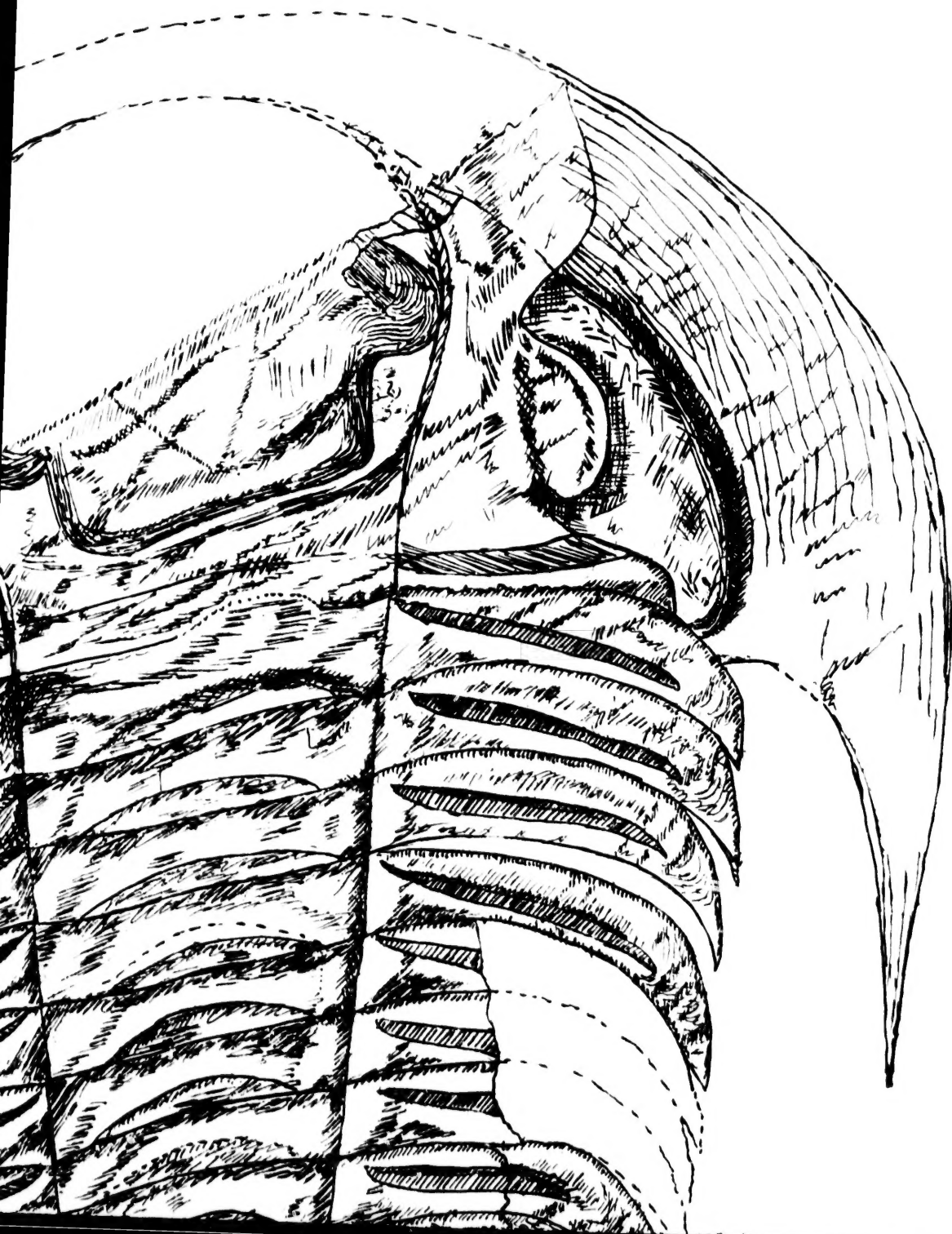


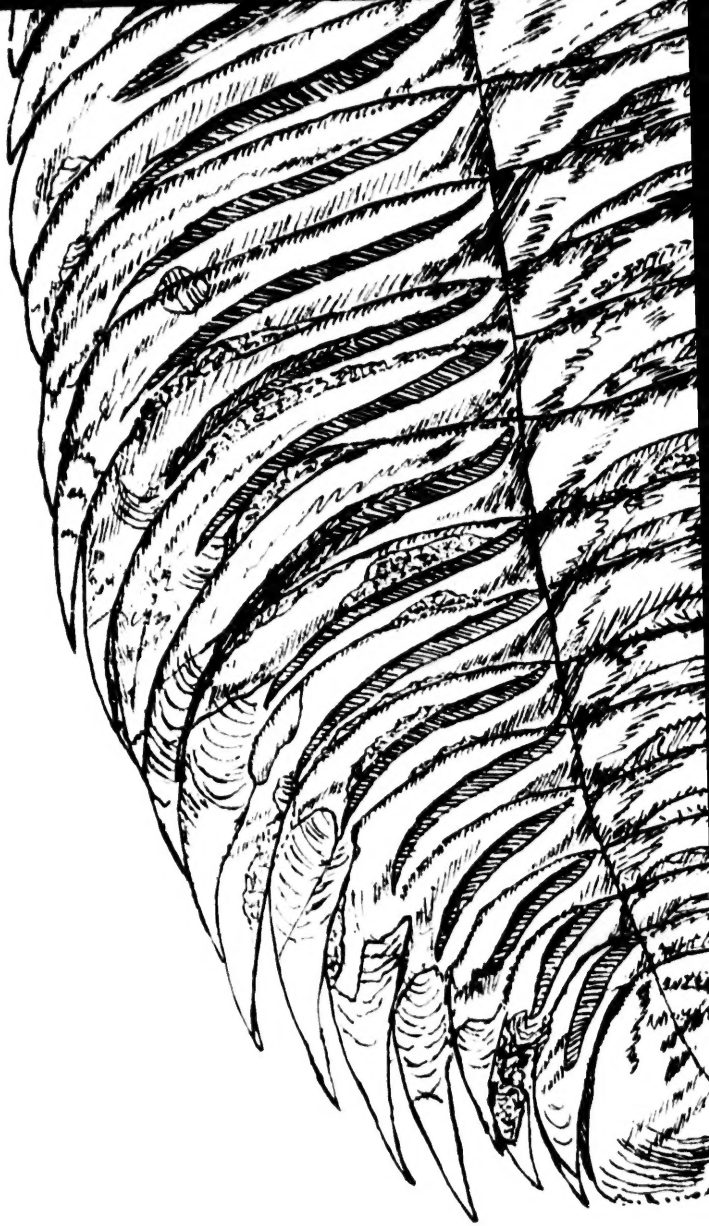


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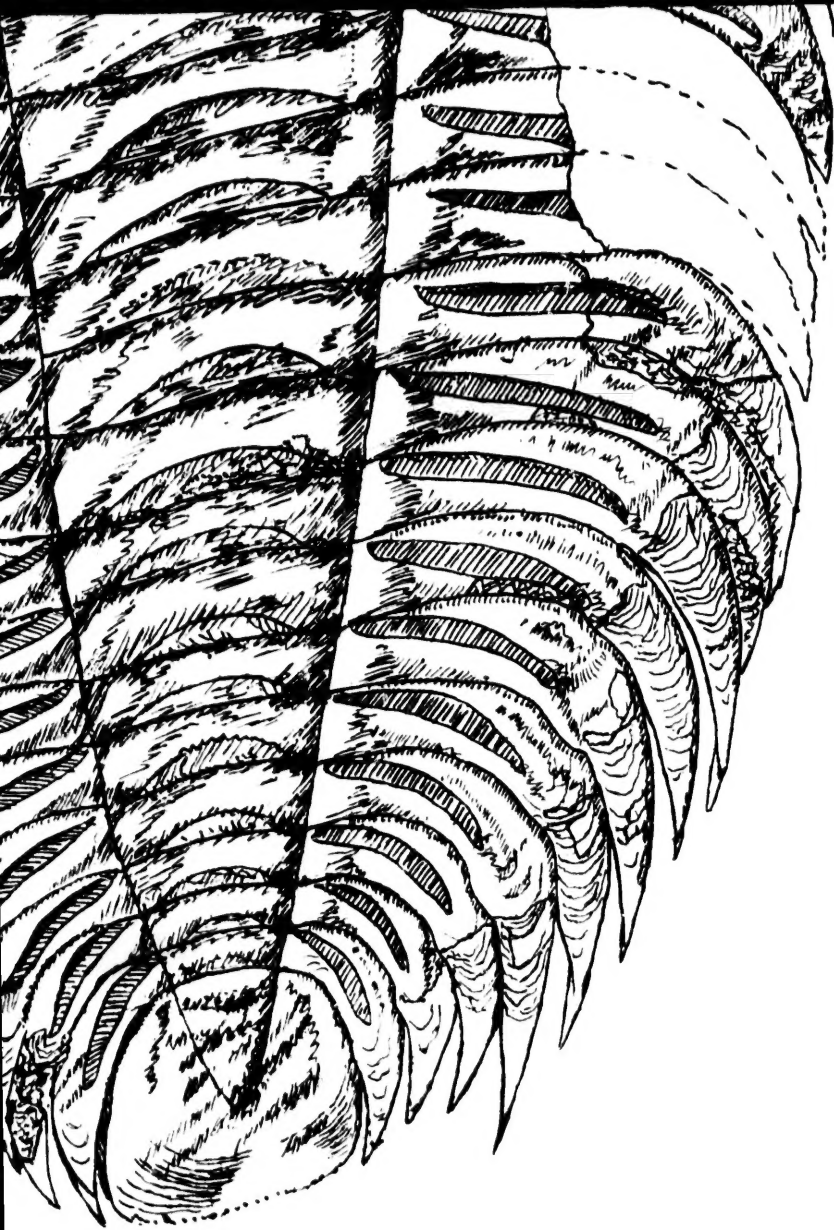






PARADOXID

To illustrate Mr. G. F. Matthew's Paper



ADOXIDES REGINA.

F. Matthew's Paper on the Fauna of the St. John Group.